Validity of IPhone Apps to Measure Knee Range of Motion in Clinical Settings

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Range of motion (ROM) of joints is a measure of musculoskeletal function in clinical and athletics settings. ROM in uniaxial joints is measured using a two-arm goniometer (GON). Although GON are inexpensive and can be used in different planes, there are limitation in accuracy and reproducibility. New IPhone apps have been developed to measure ROM using photography (PT tools, Dr.Goniometer and Photogoniometer), or the accelerometry and they also provide a permanent record of the measurement. The purpose of this study to compare the accuracy of the several IPhone apps against standard clinical [goniometer (GON)] and laboratory [electro-goniometer (EGON)] methods of measuring ROM. An EGON was attached the knee of 15 subjects knee while the performed five trials of knee extension-flexion). Three photography and one accelerometer based apps were compared against the EGON. The EGON data were compared against the GON used in clinical settings. Intraclass correlation (ICC) between methods and the Bland-Altman method (BAM) of assessing clinical agreement were used to determine validity. The ICC between the EGON and GON was r =.969 and with a BAM showing good clinical agreement between the two techniques. ICC of the photography based apps ranged from (.709-.721) and the accelerometer based goniometer was .671. The results of the BAM showed moderate to poor agreement between the methods, which indicate the some of the apps may not be suitable to use in clinical settings. The small screen size of the IPhone makes it difficult to accurately identify the joints centers. Small errors on placing the joint centers can lead to large errors of the knee joint angle. Accelerometer based apps are difficult to align and can be affected by muscle and adipose tissue of leg. It is possible that photography based apps when used on an IPad will provide better accuracy and be suitable to clinical settings.

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